United States Patent

[11] **3,547,469**

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[21] Appl. No. **740,911**
[22] Filed **June 28, 1968**
[45] Patented **Dec. 15, 1970**

[54] **MOTOR VEHICLE BUMPER WITH TRAILER CONNECTION**
6 Claims, 11 Drawing Figs.

[52] **U.S. Cl.** **280/483,** 293/68, 293/69, 293/86, 224/42.06, 280/500
[51] **Int. Cl.** **B60d 3/00**
[50] **Field of Search** 280/484, 483, 486, 500; 293/69, 68, 85, 86, 73

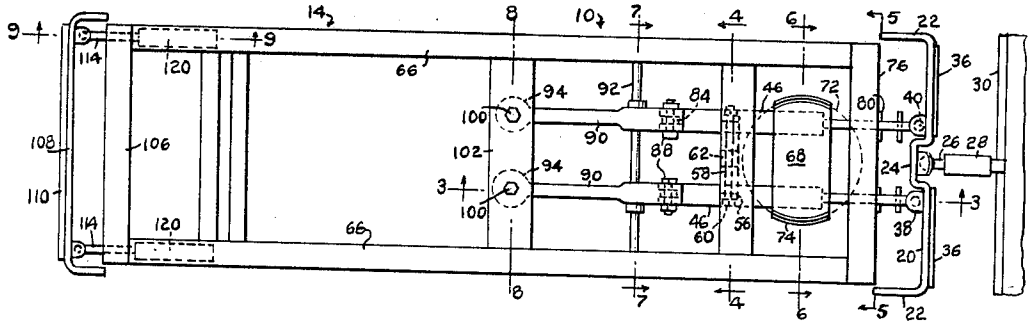
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Attorney—Alexander B. Blair

ABSTRACT: A motor vehicle bumper having a trailer connection is mounted on the vehicle so as to move longitudinally against resilient resistance to cushion the pull on the trailer and to cushion tendency of the trailer to move toward the motor vehicle when the latter is decelerated. The bumper is mounted to move downwardly vertically in the event the rear end of the vehicle passes over a hump or the trailer passes over a depression in the road, such movement of the bumper also being cushioned. A pair of cylinders have plungers therein connected to said bumper, the movement of which plungers is opposed by springs, and the cylinders are partly braced by a plate extending across and welded thereto and utilized as a spare tire carrier.



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FIG. 1.

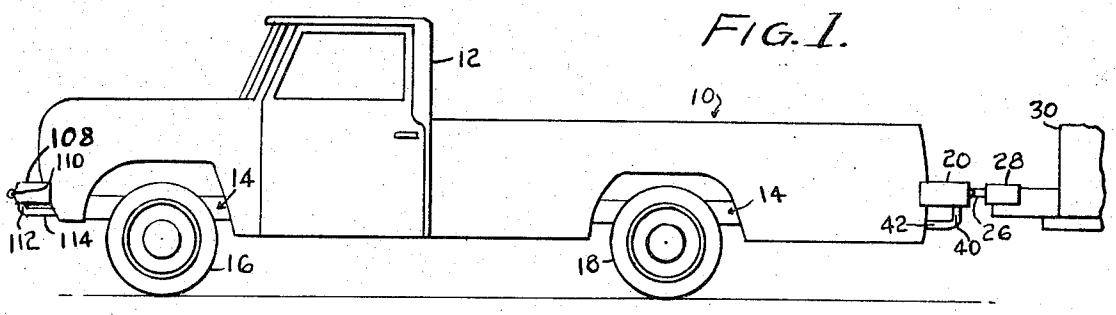


FIG. 6.

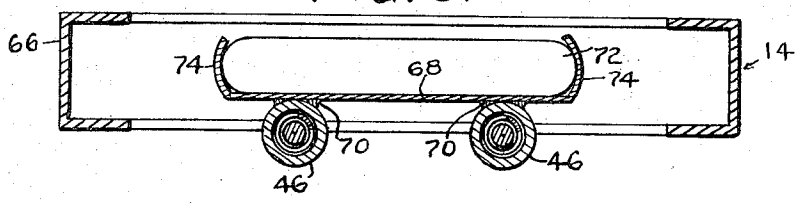


FIG. 7.

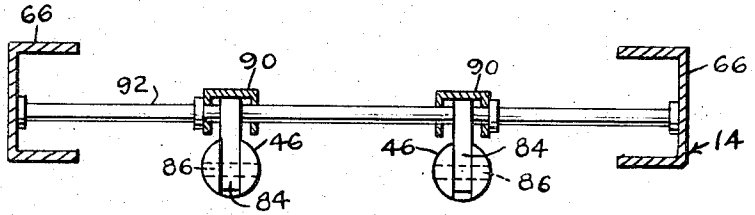


FIG. 8.

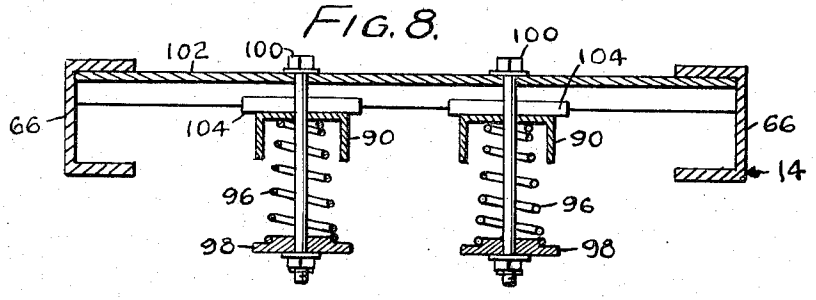


FIG. 9.

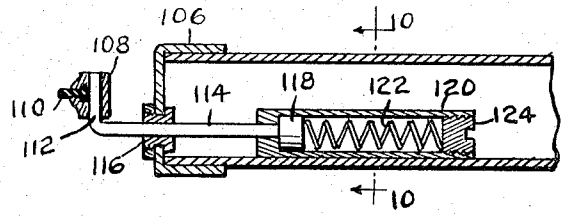
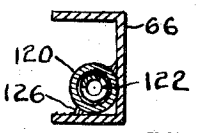


FIG. 10.



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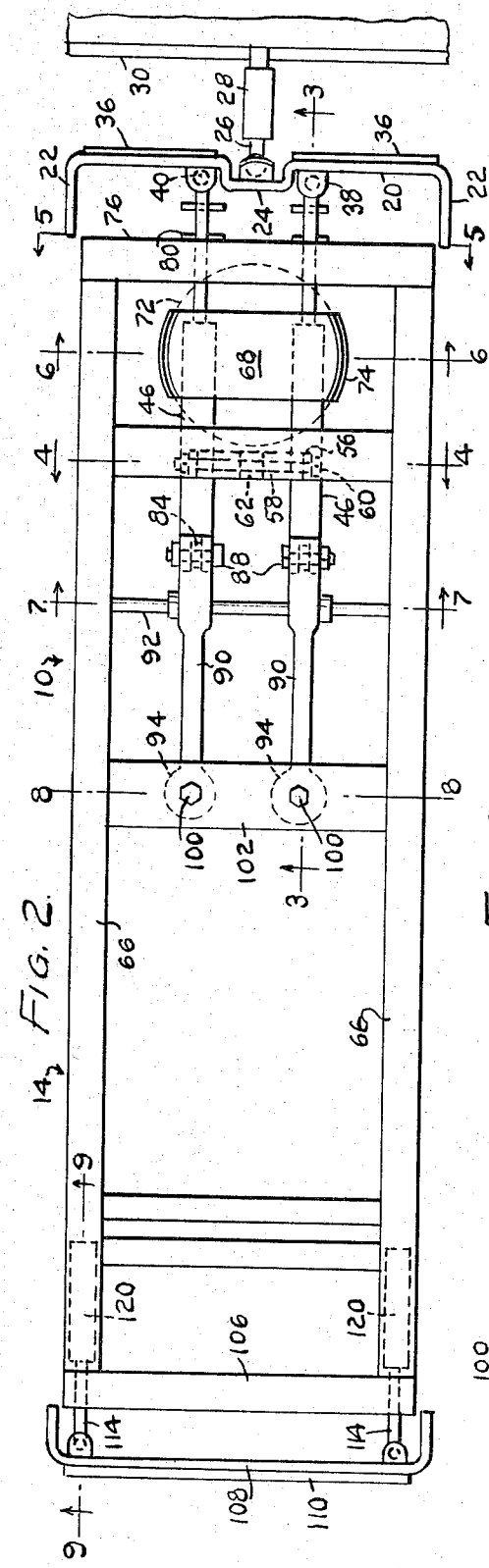


FIG. 2

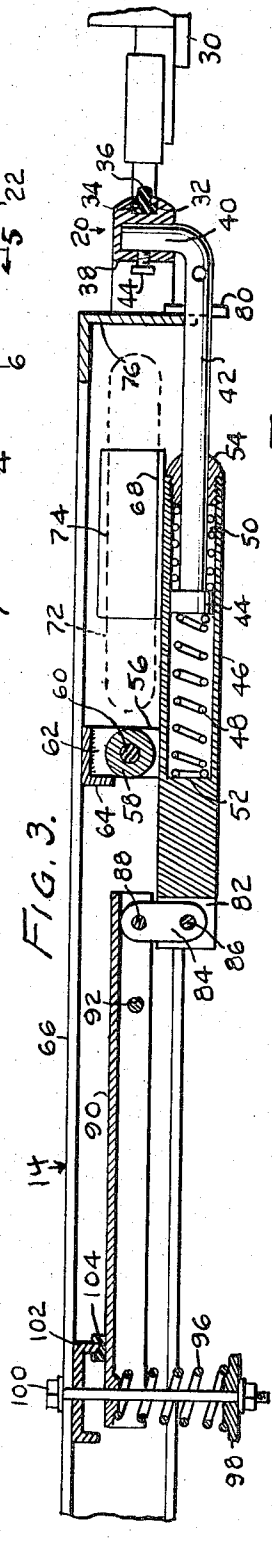


FIG. 3.

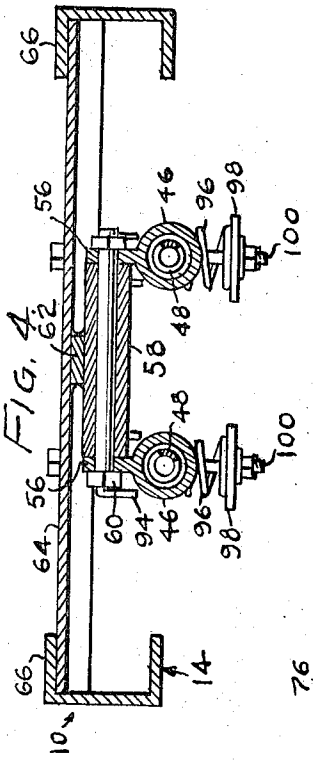


FIG. 4

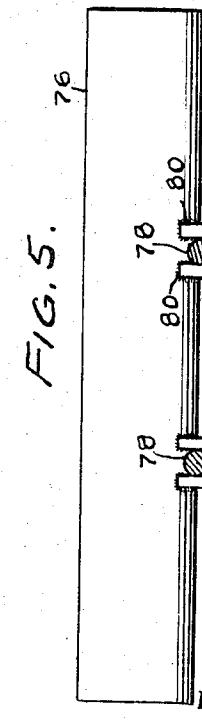


FIG. 5.

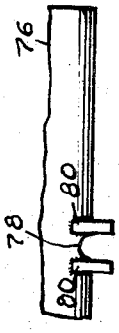


FIG. 5a.

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MOTOR VEHICLE BUMPER WITH TRAILER CONNECTION

BACKGROUND OF THE INVENTION

Most trailer hitches transmit a positive pull to the trailer when the vehicle is accelerated and a positive retarding force on the motor vehicle when decelerated. The provision of a cushioned longitudinal force in both directions will be helpful in reducing stresses and strains.

Such stresses and strains also occur through relative vertical movement of the rear end of the motor vehicle and the trailer. In my prior U.S. Pat. No. 3,342,509, granted Sept. 19, 1967, I have shown a trailer hitch wherein resilient compensation is made for relative vertical movements of the motor vehicle and trailer, although positive forces are transmitted longitudinally.

SUMMARY OF THE INVENTION

A motor vehicle, usually a truck, is provided with a bumper extending across the rear end thereof and supported by forwardly extending rods terminating in plungers operable in spaced parallel cylinders. Springs are arranged forwardly and rearwardly of the plungers to cushion forward and rear forces of the plungers imparted thereto by relative pushes and pulls longitudinally between the motor vehicle and trailer.

The plunger cylinders are fixed with respect to each other and are mounted to pivot on a transverse axis intermediate their length. The forward ends of the cylinders have link connection with pivoted lever devices mounted to rock when a downwardly force is applied to the bumper, which force causes the cylinders to rock on their pivot axis. Under such conditions the forward ends of the levers move downwardly and such movement is cushioned by compression springs, the lower ends of which are anchored relative to the vehicle frame.

The bumper is provided at opposite sides of the center thereof with resilient cushioned ribs and the trailer connection is arranged centrally of the length of the bumper and offset forwardly to expose the resilient ribs to any impacts which may be subjected directly thereto when a trailer is not connected to the vehicle.

The vehicle is provided with a front bumper also supported by longitudinal rods provided at their rear ends with plungers operable in cylinders and urged forwardly by springs to resiliently oppose impacts against the front bumper.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a side elevation of a light truck having the invention applied thereto, a portion of the forward end of a trailer being shown;

FIG. **2** is a plan view of the motor vehicle frame and associated elements, showing the trailer connection and a portion of the front end of the trailer;

FIG. **3** is a vertical longitudinal sectional view on line **3–3** of FIG. **2**;

FIG. **4** is a transverse vertical sectional view on line **4–4** of FIG. **2**;

FIG. **5** is a similar view on line **5–5** of FIG. **2**;

FIG. **5***a* is a fragmentary face view of a portion of the rear frame of the vehicle shown in FIG. **5** with the bumper supporting rods removed;

FIG. **6** is a transverse vertical sectional view on line **6–6** of FIG. **2**;

FIG. **7** is a similar view on line **7–7** of FIG. **2**;

FIG. **8** is a similar view on line **8–8** of FIG. **2**;

FIG. **9** is a detailed sectional view on line **9–9** of FIG. **2**; and

FIG. **10** is a transverse section on line **10–10** of FIG. **9**.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to FIGS. **1** and **2**, the numeral **10** designates a motor vehicle as a whole, shown in the present case as a light truck having the usual cab **12**, chassis frame **14**, and front and rear wheels **16** and **18**, respectively. Rearwardly of the vehicle

is arranged a transverse bumper **20**, the ends **22** of which turn forwardly outside the limits of the vehicle body. The bumper centrally of its length is offset forwardly as at **24** for the reception of one element **26** of a trailer hitch, the other element **28** of which is detachably connected thereto and connected at its rear end to a trailer **30**. The rearwardly offset portions of the bumper **20** are provided with preformed recesses **32** having a cushion element **34** therein provided with a rearwardly extending rib **36** projecting from the bumper to assist in absorbing impacts when the trailer is not connected to the vehicle.

At opposite sides of the center thereof, the bumper **20** is provided with sockets **38** receiving the upturned ends **40** of forwardly extending bumper supporting rods **42**. Setscrews **44** secure the ends **40** in the sockets **38**. This is merely one type of bumper supporting connection which may be employed and any desired connection for this purpose may be used.

The rods **42** are provided at their forward ends with plungers **44** (FIG. **3**) operable in cylinders **46**. Springs **48** and **50** are arranged forwardly and rearwardly of each plunger **44** to cushion movement of each plunger in opposite direction longitudinally of the vehicle. Each spring **48** seats at its forward end against the forward extremity **52** of the associated cylinder **46**, while each spring **50** seats against a bushing **54** in the rear end of the associated cylinder. Thus both forward and rear movement of the bumper **20** is resiliently resisted.

Intermediate their ends, the cylinders **46** are provided with upstanding ears **56** arranged at opposite ends of a sleeve **58**, and a bolt **60** passes through the sleeve **58** and both of the ears **56**. Intermediate its ends, the sleeve **58** is provided with an upstanding lug **62** welded thereto and welded to a cross member **64**, extending between and welded to the side frame members **66** of the chassis frame **14**. The bolt **60** is removable by unscrewing a nut at one end thereof and withdrawing the bolt for a purpose to be described. It will be apparent that the elements just described provide the single pivoting means for both cylinders **46** so that the cylinders may rock on the transverse horizontal axis of the bolt.

The pivot means just described acts as a tie between the cylinders **46** to brace them with respect to each other. Rearwardly of such means, a plate **68** is welded as at **70** to the cylinders **46** and serves to brace the cylinders with respect to each other at their rear ends. This plate is utilized as a carrier for a tire **72** and is provided at its edges transversely of the vehicle with upstanding flanges **74** which prevent movement of the tire transversely of the vehicle. Referring to FIG. **3**, it will be noted that the tire is prevented from partaking of substantial movement by the sleeve **58** and from partaking of substantial rearward movement by the transverse vehicle frame member **76** extending across the rear ends of the longitudinal frame members **66**.

The frame member **76** is provided with a pair of semicircular notches **78** (FIGS. **5** and **5***a*) in which the respective rods **42** are normally arranged. These notches permit the rear ends of the rods **42** to move downwardly to swing the cylinders **46** about the pivot axis of the bolt **60**. Such action will take place when the rear end of the vehicle passes over a hump or the trailer drops into a depression in the road. To prevent any lateral movement of the rods **42** if they move completely out of their notches **78**, guide fingers **80** are welded to the cross members **76**, as shown in FIGS. **3**, **5** and **5***a*.

At their forward ends, the cylinders **46** are vertically slotted as at **82** to receive the lower ends of links **84** pivoted to the cylinders as at **86**. The upper end of each link **84** is pivoted as at **88** to a forwardly extending lever **90** which may be of inverted channel section, as shown in FIGS. **7** and **8**. This lever is pivoted on a transverse rod **92** (FIG. **7**) extending between and fixed to the vehicle side frame members **66**. Thus, when the bumper **20** moves downwardly, the links **84** are moved upwardly to impart similar movement to the levers **90**, and the forward ends of such levers obviously will move downwardly.

The forward end of each lever **90** has its flanges widened as at **94** (FIG. **2**) to receive the upper ends of springs **96**, the lower ends of which engage a spring seat **98**. The upper end of

each spring **96** engages against the bottom of the top face of each lever **90**. A bolt **100** connects each spring seat **98** with a transverse member **102** welded or otherwise secured at its ends to the vehicle side frame members **66** (FIG. **8**).

The member **102** is provided with depending reinforcing flanges, the right-hand one of which (FIG. **3**) is provided with a rubber cushion **104** against which the lever **90** contacts at its forward end in the normal positions of the parts shown in FIG. **3**. The springs **96** therefore cushion and resist downward movement of the forward ends of the levers **90** caused by relative downward movement of the bumper **20**.

The forward ends of the side frame members **66** are connected by a transverse frame member **106**, as shown in FIGS. **2** and **9**. Forwardly of the frame member **106** is arranged a transverse forward bumper **108** which may have a resilient strip **110** projecting therefrom to cushion impacts against the bumper. The forward bumper may be mounted in the same manner as the rear bumper on the upwardly extending ends **112** of rearwardly extending rods **114** slidable in bushings **116** carried by the frame member **106**. The rear end of each rod **114** carries a plunger **118** operating in a cylinder **120** against the resistance of a compression spring **122**. The rear end of each cylinder **120** is provided with a plug **124** against which the associated spring **122** seats. Referring to FIG. **10**, it will be noted that each cylinder **120** seats against the vertical and lower horizontal flange of the associated frame member **66** and is welded thereto as at **126**.

OPERATION

Any impacts against the front end of the vehicle will be partially or wholly absorbed by the rubber rib **110** and by the springs **122** (FIG. **9**). The spring pressed mounting of the front bumper thus minimizes any damage to the bumper or forward parts of the vehicle.

When a trailer is connected to the rear end of the vehicle, as in FIGS. **1** and **2**, the acceleration of the vehicle does not transmit a direct pull in a positive manner to the trailer. The inertia of the trailer, exerting a pull on the rear bumper will compress the springs **50** (FIG. **3**), thus initiating movement of the trailer without destructive pulls thereto which might break or disconnect the trailer hitch. When the motor vehicle is decelerated, the trailer tends to move forwardly toward the vehicle, and here again a positive thrust is eliminated since such movement of the trailer will be cushioned by the springs **48**.

If the rear end of the vehicle passes over a hump in the road or the trailer passes over a depression in the road, the rods **42** will move relatively downwardly out of the recesses **78**. The cylinders **46**, effectively fixed together as a unit, will swing downwardly rearwardly of the pivot bolt **60** and upward movement of the links **84** will transmit similar movement to the rear ends of the levers **90**. These levers, at their forward ends, will move downwardly against the compression of the springs **96**, thus cushioning the movements referred to. These various cushioning actions save the transmission of sudden solid forces from the motor vehicle and to the trailer, thus minimizing the danger of any damage to the motor vehicle or trailer.

When the trailer is disconnected, the resilient ribs **36** of the rear bumper **20** will tend to cushion any impacts rearwardly of the vehicle and such impacts will be further cushioned by the springs **48** in the cylinders **46**. The springs **48** and **50** are normally loaded and balance each other so that the plungers **44** have a normal position as shown in FIG. **3**.

It is well known that difficulty is experienced in providing space for a spare tire, particularly in a truck. In the present case, the plate **68** (FIG. **6**), welded to the cylinders **46**, effectively braces these cylinders and serves as a spare tire carrier. The tire will be limited in its horizontal movements in all directions and will be limited in its upward movement by the floor of the vehicle.

When it is desired to remove this spare tire, the bolt **60** (FIG. **4**) will be removed, whereupon the bumper **20** and rods **42** drop downwardly. The plate **68** also drops downwardly and the tire can be removed rearwardly from beneath the cross frame member **76**. Thus, provision is made for supporting the spare tire without sacrificing any of the truck space or mounting the tire externally of the vehicle.

From the foregoing it will now be seen that there is herein provided an improved motor vehicle bumper with trailer connection which accomplishes all of the objects of this invention and others, including many advantages of great practical utility and commercial importance.

As various embodiments may be made of this inventive concept, and as many modifications may be made in the embodiment hereinbefore shown and described, it is to be understood that all matter herein is to be interpreted merely as illustrative, and not in a limiting sense.

I Claim:

1. In combination with a motor vehicle having a chassis frame and forward and rear ends, a bumper arranged adjacent and extending across the rear end of the vehicle, means including resilient devices supporting said bumper for movement toward and away from the vehicle, resilient means holding said bumper in a normal position from which it is vertically displaceable, said means for resiliently supporting said bumper for movement toward and away from the vehicle comprising a pair of cylinders each having a plunger therein, said cylinders being fixed to each other and mounted to turn on a transverse horizontal axis, said resilient means for holding said bumper in a normal position comprising spring means for opposing swinging movement of said cylinders about said transverse horizontal axis, said means for opposing swinging movement of said cylinders about said transverse horizontal axis comprising a lever forwardly of each cylinder, a link connecting the rear end of each lever to the forward end of the corresponding cylinder, spring means for opposing vertical movement in one direction of the other end of each lever, and pivot means extending horizontally transversely of the vehicle and fixed to said chassis frame and supporting said levers for turning movement.

2. In combination with a motor vehicle having a chassis frame and forward and rear ends, a bumper arranged adjacent and extending across the rear end of the vehicle, means including a pair of cylinders supporting said bumper for movement toward and away from the vehicle, resilient means holding said bumper in a normal position from which it is vertically displaceable, an elongated transverse bearing sleeve fixed with respect to said chassis frame, a bolt passing through said sleeve and pivotally connecting said cylinders thereto for swinging movement on a transverse horizontal axis, said sleeve being arranged forwardly of the rear ends of said cylinders, and means for resiliently opposing upward movement of the rear ends of said cylinders and hence downward movement of said bumper.

3. The combination defined in claim **2** wherein said means for opposing upward movement of the rear ends of said cylinders comprises a lever extending horizontally forwardly with respect to each of said cylinders, means for mounting said levers for pivoting movement on a transverse horizontal axis between the ends of said levers, a link pivotally connecting the forward end of each cylinder with the rear end of each lever, and means for resiliently opposing downward movement of the forward end of each lever.

4. The combination defined in claim **2** wherein said sleeve and its connections with said cylinders fix the latter against movement toward and away from each other, and a spare tire supporting plate extending across and fixed to the forward ends of said cylinders, the removal of said bolt from said sleeve permitting said bumper, said plunger rods and said cylinders to swing downwardly rearwardly of the vehicle for the removal of the tire from said spare tire plate.

5. In combination with a motor vehicle having a chassis frame and forward and rear ends, a bumper arranged adjacent and extending across the rear end of the vehicle, means including resilient devices supporting said bumper for move-

ment toward and away from the vehicle, resilient means holding said bumper in a normal position from which it is vertically displaceable, said means for resiliently supporting said bumper for movement toward and away from the vehicle comprising a pair of cylinders each having a plunger therein, a spring in each end of said cylinders engaging the adjacent end of the plunger therein to oppose longitudinal movement of said plunger in either direction, each plunger having a rod connnected to and supporting said bumper, said chassis frame comprising a transverse frame member at the rear end of said chassis frame, and a plunger mounted in each cylinder and having a rearwardly extending rod connected at its rear end to said bumper, said means for opposing movement of said bumper toward and away from the vehicle comprising a pair of springs in each cylinder arranged respectively forwardly and rearwardly of and engaging the associated plunger, each plunger rod engaging the bottom of said transverse frame member to limit upward movement of said bumper, said transverse frame member being provided with a pair of vertical guides arranged at each side of said plunger rod to permit downward movement of the latter without transverse movement.

6. In combination with a motor vehicle having a chassis frame and forward and rear ends, a bumper arranged adjacent and extending across the rear end of the vehicle, means including resilient devices supporting said bumper for movement toward and away from the vehicle, resilient means holding said bumper in a normal position from which it is vertically displaceable, said means for resiliently supporting said bumper for movement toward and away from the vehicle comprising a pair of cylinders each having a plunger therein, a spring in each end of said cylinders engaging the adjacent end of the plunger therein to oppose longitudinal movement of said plunger in either direction, each plunger having a rod connected to and supporting said bumper, said chassis frame comprising a transverse frame member at the rear end of said chassis frame, and a plunger mounted in each cylinder and having a rearwardly extending rod connected at its rear end to said bumper, said means for opposing movement of said bumper toward and away from the vehicle comprising a pair of springs in each cylinder arranged respectively forwardly and rearwardly of and engaging the associated plunger, each plunger rod engaging the bottom of said transverse frame member to limit upward movement of said bumper, said bumper being provided centrally thereof with a trailer hitch, said transverse frame member being provided with a downwardly opening notch in which each plunger rod is normally arranged, and vertical guides carried by said transverse member at each side of each notch to guide each plunger rod for vertical movement when relative vertical movement occurs between the rear end of said vehicle and a trailer connected to said trailer hitch.